We claim:

1. A process for preparing maleic anhydride by heterogeneously catalyzed gas-phase oxidation of hydrocarbons having at least four carbon atoms by means of oxygen-containing gases at from 350 to 500°C in the presence of a volatile phosphorus compound over a vanadium-, phosphorus- and oxygen-containing catalyst in a shell-and-tube reactor unit having at least one reaction zone cooled by means of a heat transfer medium, wherein the temperature and/or the amount of the heat transfer medium flowing into the first (relative to the feed direction) reaction zone are set so that the mean temperature of the heat transfer medium in the first reaction zone $T_{SB}(1^{st}$ zone), which is calculated as the mean of the inflow temperature and the outflow temperature of the heat transfer medium, is in accordance with the formulae (I) and (II)

$$T_{SB}(1^{st}\text{ zone}) \leq T_R(1^{st}\text{ zone}) - T_{Safety}(1^{st}\text{ zone}) \qquad (I)$$

$$T_{SB,Ymax}(1^{st}\text{ zone}) - T_A(1^{st}\text{ zone}) \leq T_{SB}(1^{st}\text{ zone}) \leq T_{SB,Ymax}(1^{st}\text{ zone}) + T_B(1^{st}\text{ zone}) \qquad (II),$$

where

$T_R(1^{st}$ zone) is the runaway temperature of the first reaction zone, which corresponds to the mean temperature of the heat transfer medium $T_{SB}(1^{st}$ zone) at which an increase of 1°C from a 1°C-lower mean temperature of the heat transfer medium $T_{SB}(1^{st}$ zone) - 1°C to $T_{SB}(1^{st}$ zone) causes an increase of 5°C in the hotspot temperature in the first reaction zone $T_{HS}(1^{st}$ zone);

$T_{Safety}(1^{st}$ zone) is the safety temperature of the first reaction zone and has a value of 1°C;

$T_{SB,Ymax}(1^{st}$ zone) is the mean temperature of the heat transfer medium in the first reaction zone at which the maximum maleic anhydride yield is achieved in the range $T_{SB}(1^{st}$ zone) $\leq$ $T_R(1^{st}$ zone);

$T_A(1^{st}$ zone) is 20°C; and

$T_B(1^{st}$ zone) is 10°C.

2. A process as claimed in claim 1, wherein $T_{Safety}(1^{st}\ zone)$ in the formula (II) is 2°C.

3. A process as claimed in claim 1 or 2, wherein a shell-and-tube reactor unit having at least two reaction zones cooled by means of a heat transfer medium is used.

4. A process as claimed in claim 3, wherein the temperature and/or the amount of the heat transfer medium flowing into the second (relative to the feed direction) reaction zone are set so that the mean temperature of the heat transfer medium in the second reaction zone $T_{SB}(2^{nd}\ zone)$, which is calculated as the mean of the inflow temperature and the outflow temperature of the heat transfer medium, is in accordance with the formulae (III) and (IV)

$$T_{SB}(2^{nd}\ zone) \leq T_R(2^{nd}\ zone) - T_{Safety}(2^{nd}\ zone) \qquad (III)$$

$$T_{SB,Ymax}(2^{nd}\ zone) - T_A(2^{nd}\ zone) \leq T_{SB}(2^{nd}\ zone) \leq T_{SB,Ymax}(2^{nd}\ zone) + T_B(2^{nd}\ zone) \qquad (IV),$$

where

T_R(2nd zone) is the runaway temperature of the second reaction zone, which corresponds to the mean temperature of the heat transfer medium T_{SB}(2nd zone) at which an increase of 1°C from a 1°C-lower mean temperature of the heat transfer medium $T_{SB}(2^{nd}\ zone) - 1°C$ to $T_{SB}(2^{nd}\ zone)$ causes an increase of 5°C in the hotspot temperature in the second reaction zone $T_{HS}(2^{nd}\ zone)$;

$T_{Safety}(2^{nd}\ zone)$ is the safety temperature of the second reaction zone and has a value of 1°C;

$T_{SB,Ymax}(2^{nd}\ zone)$ is the mean temperature of the heat transfer medium in the second reaction zone at which the maximum maleic anhydride yield is achieved in the range $T_{SB}(2^{nd}\ zone) \leq T_R(2^{nd}\ zone)$;

$T_A(2^{nd}\ zone)$ is 10°C; and

$T_B(2^{nd}\ zone)$ is 10°C.

5. A process as claimed in claim 4, wherein $T_{Safety}(2^{nd}\ zone)$ in the formula (IV) is 2°C.

6. A process as claimed in any of claims 3 to 5, wherein the temperature and/or the amount of the heat transfer medium flowing into the second reaction zone are set so that the hotspot temperature of the second reaction zone $T_{HS}(2^{nd}$ zone) is higher than the hotspot temperature of the first reaction zone $T_{HS}(1^{st}$ zone).

7. A process as claimed in any of claims 1 to 6, wherein a catalyst bed which is structured in respect of its activity is used in at least one of the reaction zones.

8. A process as claimed in any of claims 1 to 7, wherein the hydrocarbon used is n-butane.

9. A process as claimed in any of claims 1 to 8, wherein the volatile phosphorus compound used is a tri(C_1-C_4-alkyl) phosphate.

10. A process as claimed in any of claims 1 to 9, wherein the heterogeneously catalyzed gas-phase oxidation is carried out at a pressure of from 0.1 to 1 MPa abs.